

WHAT IS CLAIMED IS:

1. A manufacturing method of a semiconductor device comprising:
forming a laminate structure comprising a lower first conductive layer and an
5 upper second conductive layer over a semiconductor layer with a gate insulating film
interposed therebetween;
forming a mask pattern over the laminate structure;
forming a first conductive layer pattern having a tapered edge by etching the
second conductive layer and the first conductive layer;
10 recessing an edge of the mask pattern remaining on the first conductive layer
pattern;
forming a second conductive layer pattern by selectively etching the second
conductive layer in the first conductive layer pattern in accordance with of the mask
pattern; and
15 forming an LDD region in a region of the semiconductor layer overlapping with
the first conductive layer in the second conductive layer pattern by using the second
conductive layer in the second conductive layer pattern as a mask for shielding ions
accelerated by an electric field.
- 20 2. The method according to claim 1, wherein the first conductive layer is made
of tungsten, and the second conductive layer is made of aluminum or metal having
aluminum as the main component.
3. The method according to claim 1, wherein the edge of the mask pattern
25 remaining on the first conductive layer pattern is recessed by oxygen plasma treatment.
4. A manufacturing method of a semiconductor device comprising:
forming a laminate structure over a semiconductor layer by sequentially
depositing a first conductive layer, a second conductive layer, and a third conductive layer
30 with a gate insulating film interposed therebetween;

forming a mask pattern on the laminate structure;
forming a first conductive layer pattern having a tapered edge;
recessing an edge of the mask pattern remaining on the first conductive layer pattern;

5 forming a second conductive layer pattern by selectively etching the third conductive layer and the second conductive layer in the first conductive layer pattern on the in accordance with basis of the mask pattern; and

forming an LDD region in a region of the semiconductor layer overlapping with the first conductive layer in the second conductive layer pattern by using the third
10 conductive layer and the second conductive layer in the second conductive layer pattern as a mask for shielding ions accelerated by an electric field.

5. The method according to claim 4, wherein the first conductive layer is made of tungsten, the second conductive layer is made of aluminum or alloy or compound
15 having aluminum as the main component, and the third conductive layer is made of titanium nitride.

6. The method according to claim 4, wherein the edge of the mask pattern remaining on the first conductive layer pattern is recessed by oxygen plasma treatment.

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7. A manufacturing method of a semiconductor device comprising:

forming a laminate structure comprising a lower first conductive layer and an upper second conductive layer over a semiconductor layer with a gate insulating film interposed therebetween;

25 forming a mask pattern on the laminate structure;

performing plasma treatment for decreasing the taper angle of an edge of the mask pattern;

forming a first conductive layer pattern having a tapered edge by etching the second conductive layer and the first conductive layer of the laminate structure by using
30 the mask pattern;

forming a second conductive layer pattern by selectively etching the second and third conductive layers in the first conductive layer pattern; and

forming an LDD region in a region of the semiconductor layer overlapping with the first conductive layer in the second conductive layer pattern by using the second
5 conductive layer in the second conductive layer pattern as a mask for shielding ions accelerated by an electric field.

8. The method according to claim 7, wherein the first conductive layer is made of tungsten, and the second conductive layer is made of aluminum or metal having
10 aluminum as the main component.

9. The method according to claim 7, wherein the edge of the mask pattern remaining on the first conductive layer pattern is recessed by oxygen plasma treatment.

15 10. The method according to claim 7, wherein the width of the mask pattern is decreased by plasma treatment using a fluorine-based gas.

11. A manufacturing method of a semiconductor device comprising:

forming a laminate structure over a semiconductor layer by sequentially
20 depositing a first conductive layer, a second conductive layer, and a third conductive layer with a gate insulating film interposed therebetween;

forming a mask pattern on the laminate structure;

performing plasma treatment for etching the third conductive layer and decreasing the taper angle of an edge of the mask pattern;

25 forming a first conductive layer pattern having a tapered edge by etching the second conductive layer and the first conductive layer of the laminate structure by using the mask pattern;

forming a second conductive layer pattern by selectively etching the second and third conductive layers in the first conductive layer pattern; and

30 forming an LDD region in a region of the semiconductor layer overlapping with

the first conductive layer in the second conductive layer pattern by using the second and third conductive layers in the second conductive layer pattern as a mask for shielding ions accelerated by an electric field.

5 12. The method according to claim 11, wherein the edge of the mask pattern remaining on the first conductive layer pattern is recessed by oxygen plasma treatment.

 13. The method according to claim 11, wherein the width of the mask pattern is decreased by plasma treatment using a fluorine-based gas.

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